Bark and Wood-Boring Beetle Biological Evaluation of the Ironton Roadside Fuels Reduction Project

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ABSTRACT

In May and June of 2003, personnel from the USDA Forest Service, Northeastern Area, Forest Health Protection, Morgantown Field Office conducted bark and wood-boring activity surveys on the Ironton Ranger District of the Wayne National Forest (WNF). The purpose of these surveys was to estimate the current beetle activity and potential for a beetle outbreak as a result of the February 15-17, 2003, ice storm. Overall beetle activity was light, the pine engraver *Ips pini* (Coleoptera, Scolytidae) and *Pityogenes hopkinsi* (Coleoptera, Scolytidae) were detected in downed pine trees, tops, and slash but not in significant numbers, even though host material was readily available for colonization. Heavy ice storm damage was present in the Peckerwood, Thompson Cemetery, and Peniel Fuel reduction areas. The remaining areas had only individual tree damage or small pockets of less then 5 acres of downed or damaged trees. Unless significant increases in beetle populations occur this summer, no outbreaks to standing timber are expected. Continued monitoring for insect activity is recommended until the Ironton Roadside Fuels reduction program can be implemented.

INTRODUCTION

As a result of the weekend ice storm of February 15-17, 2003, approximately 550 acres along public roads were identified as having an extreme amount of woody debris within a half mile of privately owned structures. The woody debris created by this storm is expected to cure during the summer and create unacceptable burning conditions. A Decision Memo was released in June 2003, documenting that approximately 200 feet on either side of public roads in areas designated to be at highest risk for catastrophic wildfire would be treated. Branches smaller than one inch would be left on the ground. Woody debris 1 inch to 6 inches in diameter would be either chipped and removed from National Forest land to off-site disposal areas, or looped and scattered to a depth of less than two feet over the treatment site. (USDA 2003).

Ice storms are one of a number of abiotic factors that affect eastern forests. These natural and reoccurring events occur with varying degrees of intensity, duration, and frequency. Van Dyke (1999) provides a literature review of the chronology of ice storms for eastern North America. A summary of this information shows that the eastern United States has experienced 9 major ice storms events since 1934. These include storms in New England in the late 90's affecting 17 million acres of forested land, in Ohio in 1986, on the Cheat Mountain Range in West Virginia in 1956, and an extensive glaze storm covering New York, New England and Canada in 1942. Fire and insect activity are generally considered the main driving forces behind forest succession, but the common occurrence and extent of ice storms in the eastern United States illustrates how these natural reoccurring disturbances can affect and is a necessary factor in sustaining forest diversity, structure, and function (Hopkin 2001).

POTENTIAL FOR BEETLE OUTBREAKS

After the ice storm, concern was raised that additional tree mortality would occur by Scolytidae (Bark Beetles), Cerambycidae (longhorned beetles) and Buprestidae (Metallic wood borers) beetle populations. Bark beetles and wood-boring beetles decompose dead trees as well as attack stressed ones. The ecological role of these beetles is to act as thinning agents, removing the weakened tree for the environment and assisting in nutrient cycling (Ryall and Smith 2001). Most hardwood and conifers have at least one associated bark or wood boring beetle that is capable of attacking and killing trees under the right condition. The opportunistic natural of these beetles usually requires that the host tree be under some form of stress. The ice storm and the subsequent spring defoliation (See FHP Report No. NA-03-10) that occurred certainly created such an opportunity.

Scolytid beetles are highly specialized to take advantage of habitats that are ephemeral. Once the cambial tissue of the host has dried, it is no longer suitable for most bark beetles; as a result, a host can be used only for a short time. The native pine engraver (*Ips pini*) occurs through the eastern United States and breeds in all species of pine (USDA 1985). Infestation usually develops in logging slash and windfalls or in trees dying from other causes (USDA 1985). When heavy building populations are present in this type of material, nearby healthy trees may be attacked and killed (USDA 1985).

A common feature of wood-boring beetles in the families Cerambycidae and Buprestidae is their association with wood decay fungi and their role as recyclers. Many wood-boring species are capable of girdling and killing healthy and injured trees (USDA 1985). The sugar maple borer (*Glycobius speciosus*), two lined chestnut borer (*Agrilus bilineatus*), and the red oak borer (*Enaphalodes rufulus*), are a few of the important hardwood borers in eastern North America. These species attack healthy and stressed trees and may cause substantial damage eventually leading to mortality, an example of which recently occurred in southern Missouri, where thousands of acres of oak have been killed by the red oak borer.

POTENTIAL FOR FUTURE TREE MORTALITY

Although literature is available on ice storm damage, some of the best comes from the ice storm of 1998; which occurred in the New York and New England area. This ice storm affected 17 million acres of forested land. Insect surveys and studies show no increase in insect activity as a result of this ice storm (Personnel Communication, Ryall and Smith 2001).

The expectation for recovery for an individual tree can be related to the amount of crown loss due to breakage (Table 1). Hardwood trees are seldom killed by breakage and many species will sprout prolifically to recover from the damage. Hardwood trees with greater than 75 percent crown loss are expected to die (Van Dyke 1999, Smith and Shortle 1998, Lamson and Leak 1998). Conifers that have broken below the live crown, or that have had a majority of the crown removed are not expected to survive. (Van Dyke 1999, Smith and Shortle 1998, Lamson and Leak 1998).

Table 1. Damage categories based on percent crown loss and expected tree impact based on results from the 1998 ice storm in New York and New England[1].

Damage Category	Crown loss (%)	Impact on tree Survival
No damaged	0	None
Light/moderate	1-49	Survival good
Heavy	50-79	Survival likely, growth affected
Severe	80-100	Survival unlikely

[1] The Northeastern Ice Storm 1998: A Forest Damage Assessment. USDA Forest Service Publication, Durham NH, 32 p.

OBJECTIVES

The objectives of this survey were to: 1) accurately assess current bark and wood-boring beetle activity and populations within the fuel reduction areas on the Wayne National Forest; 2) determine the likelihood of a beetle outbreak as a result of the availability of damaged, downed, and stressed trees.

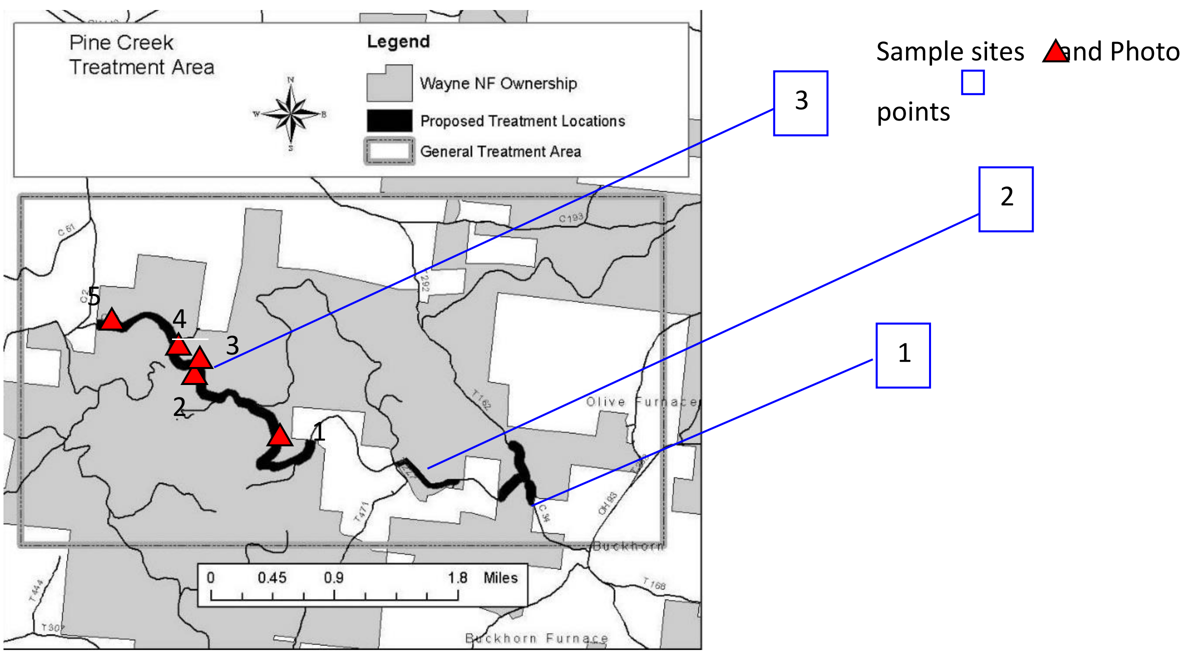
METHODS

The methods used to evaluate the current and future bark and wood-boring beetle: 1) aerial photo interpretation; 2) site visits; 3) Lindgren funnel trap samples; 4) estimates of the amount, species affected and type of downed and damaged material available for colonization; 5) presence and species of current insect activity; 6) risk of population increase.

RESULTS

The five-fuel reduction areas surveyed are represented in Maps 1-5. Overall bark and wood-boring beetle activity was light, although downed trees, tops, and slash were available for colonization. Heavy ice storm damage was present in the Peckerwood, Thompson Cemetery, and Peniel Fuel reduction areas. The remaining areas had only individual tree damage or small pockets of less than 5 acres of downed or damaged trees. Unless significant increases in beetle populations occur this summer, no outbreaks to standing timber are expected.

Map 1. Pine Creek Fuel Reduction Area



Pine Creek Photo Points and Sample Plots

Figures 1 and 2. County road 34 and Buckhorn pine creek and brushy fork (Map 1), mixed stand of white pine, oak, maple, and fields. Overall very little downed material within the 200 foot buffer area. Some isolated downed trees with no current insect activity.

Figure 1. Photo point on County road 34, Buckhorn and Brushy Fork roads.

Figure 2. County road 34, and Buckhorn road.

Figure 3. Buckhorn road and T471 white pine plantation, Sycamore, maple, and fields. Overall: little to no downed material, some scattered pockets of downed Virginia pines (3-5 trees) and trees with broken tops. White pine plantation, (BA 180-220), numerous snags within 200-foot treatment area, some *Pityogenes hopkinsi* activity in downed material. Numerous pockets of downed trees, broken tops and branches and slash material are present on private land between photo sites 2 and 3.

Buckhorn road.

Figure 4. This is a long stretch of road with little damaged material on the west side of the road. Small piles of slash do occur along the roadside, with isolated damaged trees and pockets of tops and downed branches. Past the Pine Creek Chapel there is little downed material within the 200 ft buffer, the area is open with several converging power lines and fields.

Figure 3. Pockets of damaged Virginia pine along Buckhorn road.

Figure 4. View along Buckhorn road.

Plot 1. An estimated two to four acres of mixed heavily damaged Virginia pine just east of the ORV trail, no current insect activity detected (Figure 5).

Plot 2. An estimated one to two acre stand of heavily damaged Virginia pine, (Figure 6), with no current insect activity detected. Good hardwood regeneration of beech, red and sugar maple and white oak (Figure 7).

Figure 5. Mixed stand along Buckhorn road and Forest ORV trailhead.

Figure 6. Virginia pine stand heavily damaged by ice storm.

Figure 7. Regeneration in damaged stand.

Figure 8. Virginia pine slash.

Plot 3. Estimated one-acre stand of heavily damaged Virginia pine, no insect activity detected (Figure 8).

Plot 4. An estimated three-five acre mixed stand of heavily damaged Virginia pine (Figure 9), no insect activity detected.

Plot 5. White pine plantation with light scattered damage some downed trees and broken tops. *Pityogenes hopkinsi* infesting downed material (Figure 10).

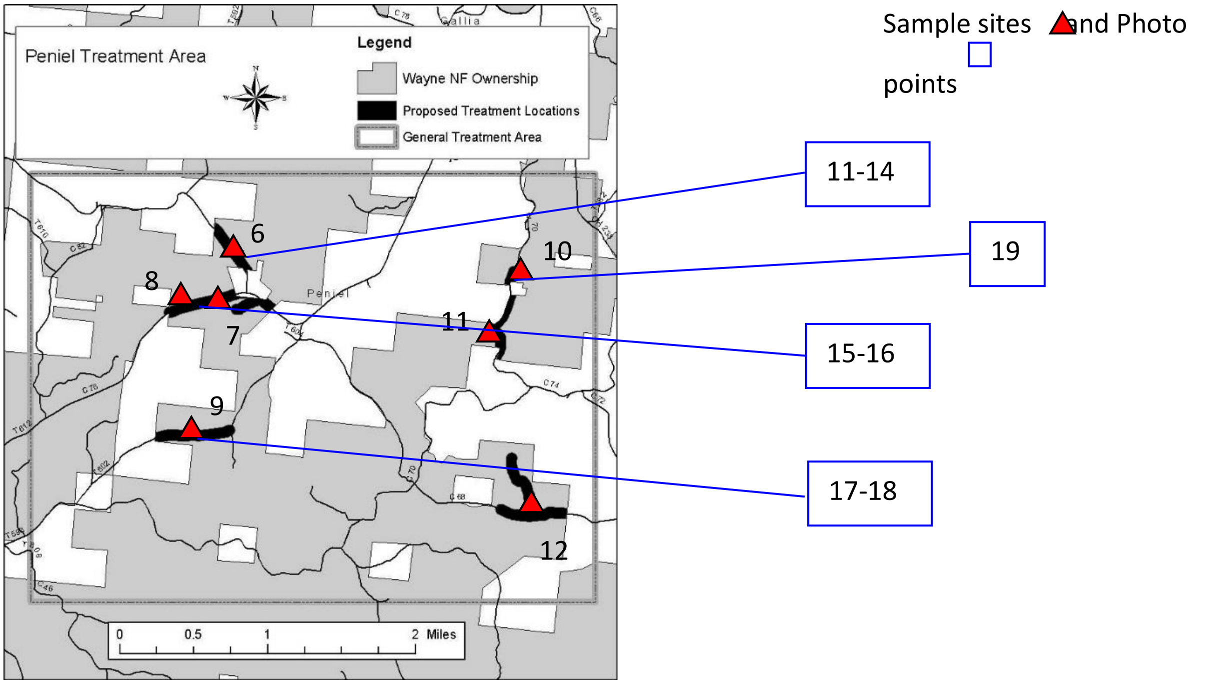
Figure 9. Slash and downed Virginia pine.

Figure 10. Pityogenes beetles attacking downed white pine tops and slash.

Pine Creek Area Summary

Overall conifer damage was confined to Virginia pine stands, on an estimated seven to twelve acres. Damage within these mixed stands was heavy where it occurred, but most of the areas damaged were less than three acres in size. The majority of the Pine Creek Fuel Area suffered only scattered light to no damage at all. No insect activity was detected with the exception of *Pityogenes hopkinsi* infesting downed white pine.

Map 2. Peniel Fuel Reduction Area



Peniel Photo Points and Sample Plots

Plot 6. Twenty-five acres or more Virginia pine stand (Map 2) heavily damaged (Figure 11 and 13), numerous slash piles along the road (Figures 12 and 14). No current insect activity detected.

Figure 11-14. Heavily damaged Virginia pine stand along Pokepatch Road.

Figure 11.

Figure 12.


Figure 13.


Figure 14.

Plots 7 and 8. Two White pine plantations on either side of Dirtyface creek road (Figures 15 and 16), both sustained light to no damage with a few broken branches and tops, *Pityogenes* activity in all downed material. Small isolated pockets of downed trees, broken tops and slash piles along road and within 200 foot buffer.

Plot 9. Hoadley road, a mixed stand of Virginia pine and hardwoods with almost continous ice damage along the northern side of road (Figure 17). Southern side of the road (Figure 18) has small-scattered pockets of individual damaged trees. No current detectable insect activity.


Figure 17. Northern side of Hoadley road.


Figure 18. Southern side of Hoadley road.

Plot 10. County Road 24, mixed stand of Virginia pine along west side of road moderate amount of downed and damaged trees (Figure 19). East side of road has small piles along the roadside and scattered pockets of slash and downed and broken material. No current insect activity.


Figure 19. West side of County road 24.

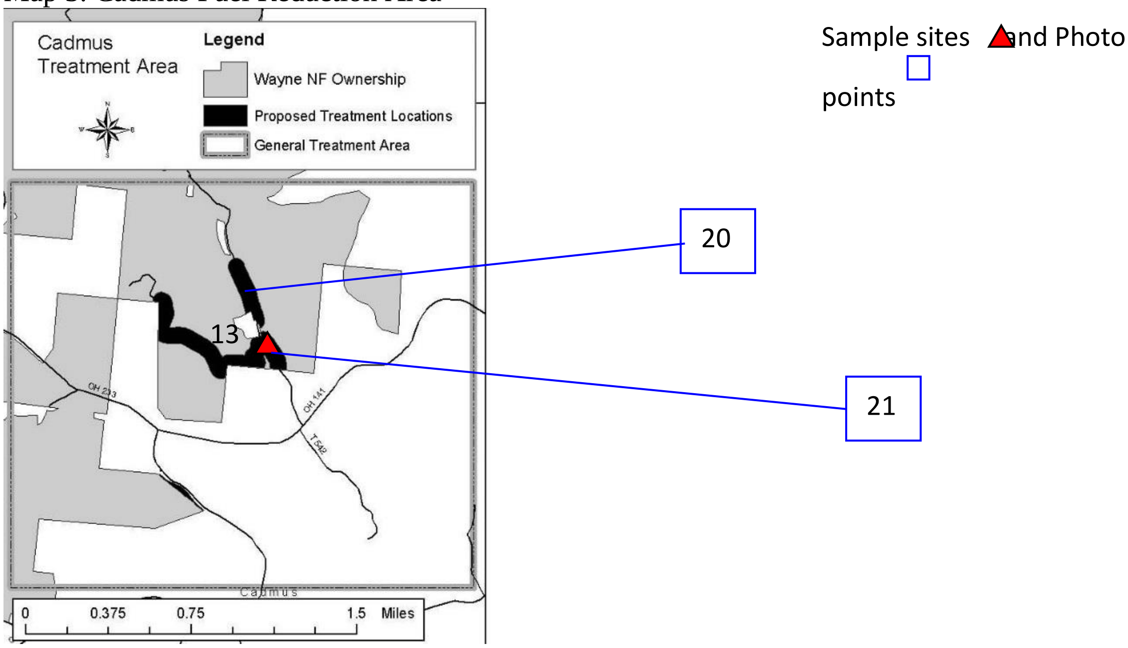
Plot 11. County Road 24, ¼-acre site across from private home with downed Virginia pine and slash and broken tops. No current insect infestation.

Plot 12. Camp road, riparian zone along river and power lines, scattered pockets of downed Virginia pine and broken topped sycamores along river. No current insect activity detected.

Peniel Area Summary

The 25+-acre site along Pokepatch road and the north side of Dirtyface road sustained heavy ice storm damage to both Virginia pine and hardwoods. The majority of the Peniel Fuel Area suffered only scattered light damage to no damage at all. No insect infestations were detected at this time.

Map 3. Cadmus Fuel Reduction Area



Cadmus Photo Points and Sample Plots

Figure 20. Vernon Woods Road north end of treatment area is fields and power lines with little to no damaged trees.

Figure 21 and Plot 13. East and wide sides of Vernon woods road, heavily stocked (BA 150-170) white pine plantations in decline, light to no ice storm damage. Numerous snags in stands, no current insect activity detected.

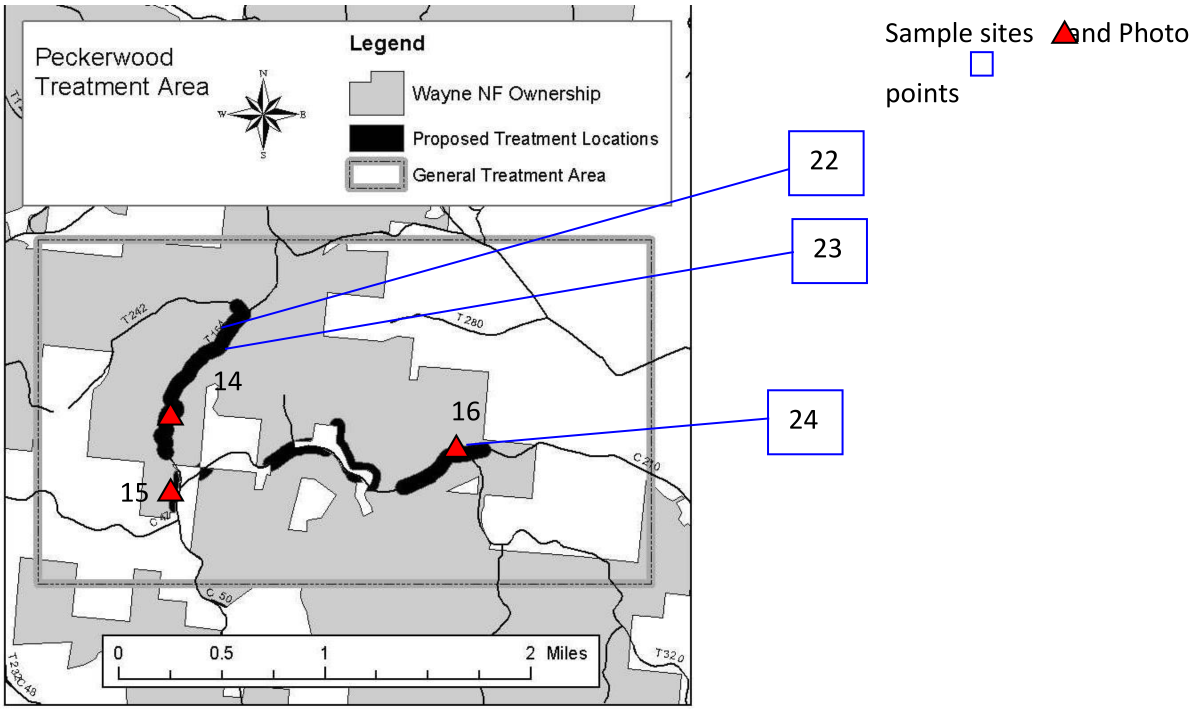
Figure 20. Western end of Vernon woods road.

Figure 21. White pine plantation Forest road 83.

Cadmus Area Summary

There is little to no ice storm related damage present within the Cadmus fuel reduction area. Heavily stocked white pine plantations within the fuel reduction area in the process of decline, with no current insect activity expect secondary insects infesting dead trees.

Map 4. Peckerwood Fuel Reduction Area



Peckerwood Photo and Sample Plots

Plot 14. Township road 154 scattered individual downed and broken trees to half-acre spots of downed Virginia pine and hardwoods (Figures 22 and 23). Some areas with a number of downed trees near road, *Ips pini* activity in Virginia pines.

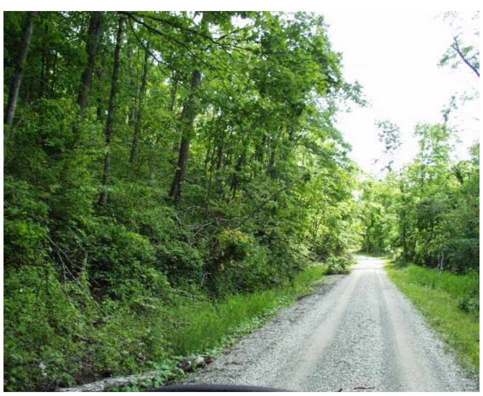


Figure 22. Western end of Township road 154.

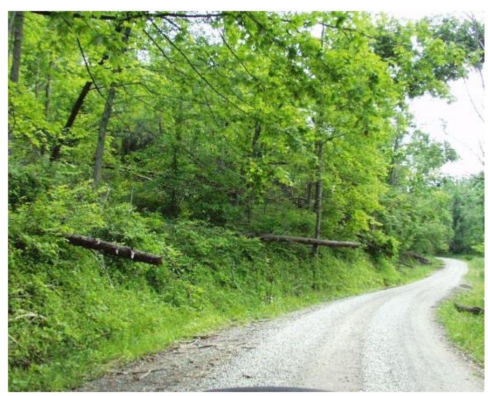


Figure 23. Western end of Township road 154.

Plot 15. Two-three acre areas of mixed Virginia pine stand with moderate to heavy damaged and downed trees and slash; some slash along Township road 154.

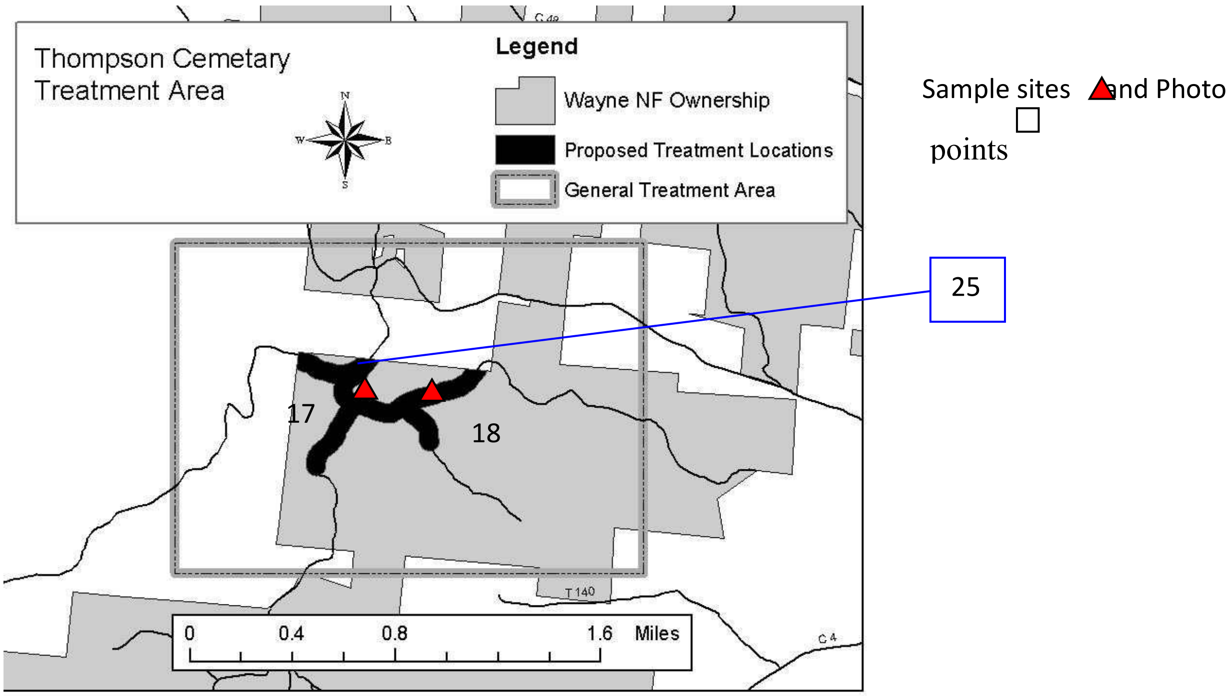
Figure 24. Continous ice storm damage along Forest Ridge road.

Plot 16. Forest ridge road, almost continuous moderate to heavy damaged with downed branches within 200 foot buffer area. Very little pine present, no current insect activity detected (Figure 24).

Peckerwood Area Summary

Damage within these mixed stands was heavy throughout the Fuel Reduction area. *Ips pini* was active in the downed Virginia pine along Township road 154.

Map 5. Thompson Cemetery Fuel Reduction Area



Thompson Cemetery Photo Points and Sample Plots

Figure 25. Continuous ice storm damage along Township road 160.

Plot 17. Township road 140, heavy continuous damaged and down trees, large slash piles along road (Figure 25). No current insect activity detected.

Plot 18. Township road 140, heavy continuous damaged and down trees, large slash piles along road (Figure 25). No current insect activity detected.

Thompson Cemetery Summary

Damage within these mixed stands was heavy throughout the Fuel Reduction area. Downed and broken trees and slash are fairly continuous along the roadsides. No current insect activity was detected.

DISCUSSION

Insect populations will not develop unless suitable material is available in the proper condition to be used as a resource. The February 15-17 ice storm caused damage to a substantial portion of the District. The major affect of the storm was downed or damaged trees and slash, all potential host material for bark and wood-boring beetle development. However, to date, no large scale infestation has occurred.

Although some literature exist on eastern North American ice storms, very few studies examine the insect activity that occurs as a result of this type of disturbance (Personal communication Allen 2003, Ryall and Smith 2001, Van Dyke 1999). As stated by Allen (1998) this may be due to fact that the eastern United States and eastern Canada lack the aggressive bark beetles typical of southern and western conifer forests. This also may be due to the timing and availability of the host resource, the long generation time for some wood-boring beetles, or the dynamics and impact of predators and parasites, or some other factor.

Regardless, the timely treatment of woods debris by chipping or removal as outlined in the decision memo should greatly reduce or eliminate the chances of bark beetle outbreaks within the Fuel reduction areas. This, along with the recommendation to remove all trees likely to die as a result of ice storm damage should reduce or eliminate the risk of wood-boring beetle outbreaks.

MANAGEMENT ALTERNATIVES

Since the Wayne National Forest has already decided on a course of action for this area no management alternatives are recommended.

RECOMMENDATIONS

The following are general and specific recommendations that can be applied to the Fuel Reduction areas.

- Standing hardwood trees with greater than 75 percent of their pre-storm crown loss should be removed.
- Standing conifers with all or greater than 70 percent of their pre-storm crown loss should be removed.

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INSECT BIOLOGIES

Ips pini, the pine engraver, occurs throughout most coniferous forest of the United States. It breeds in all species of pine and spruce within its range. Infestations usually develop in logging slash and windfalls or in trees dying of other causes. When heavy populations build up in this type of material, nearby healthy trees may be attacked and killed. (Baker 1972).

Pityogenes hobkinsi is a common species that hosts on eastern white pine and occurs in the eastern United States. In early spring, overwintering adults infest winter pruned limbs and other white pine slash. A summer generation attacks trees weakened or stressed. Slash may be infested whenever slash becomes available (Baker 1972).